

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-314734

(43)Date of publication of application : 05.12.1995

(51)Int.Cl.

B41J 2/205

B41J 3/60

(21)Application number : 06-106600

(71)Applicant : CANON INC

(22)Date of filing : 20.05.1994

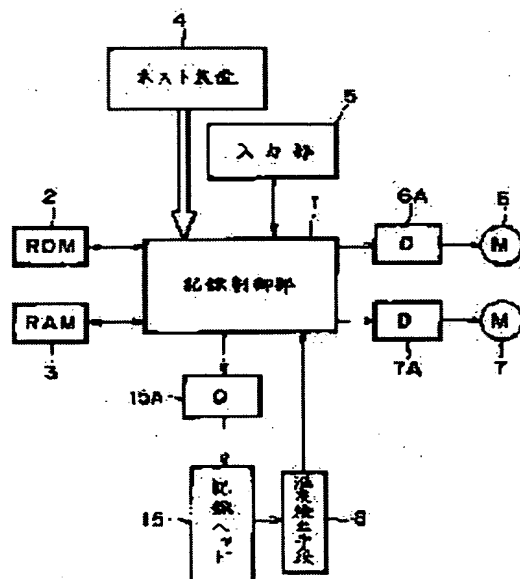
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## (54) INK JET RECORDER

## (57)Abstract:

PURPOSE: To provide an ink jet recorder which can make offset less conspicuous if desired in the case of perfect recording.

CONSTITUTION: An ink jet recorder comprises recording density converting means 15A and 15B, a recording density selecting means 5, a perfect and single recording mode specifying means 5 and a control means 1 for the control of varying the recording density in compliance with the density selected by the density selecting means at the time of specifying the perfect recording mode.



## LEGAL STATUS

[Date of request for examination] 16.12.1999

[Date of sending the examiner's decision of rejection] 22.06.2001

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's  
decision of rejection]

[Date of requesting appeal against examiner's  
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CLAIMS

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[Claim(s)]

[Claim 1] An ink jet recording device characterized by providing the following A concentration change means to change record concentration A concentration selection means to choose said record concentration The control means which is the ink-jet recording device in which record implementation in the mode which has a mode assignment means specify a double-sided recording mode or an one side recording mode, and was specified by this mode assignment means is possible, and controls to change said record concentration according to concentration chosen by said concentration selection means when said double-sided recording mode is specified by said mode assignment means

[Claim 2] Said concentration change means is an ink jet recording device according to claim 1 which is a means to change an amount of ink by which the regurgitation is carried out per area for record, and is characterized by making said record concentration low by lessening an amount of this ink.

[Claim 3] An ink jet recording device according to claim 1 or 2 characterized by being controlled so that record concentration becomes low rather than the time of said one side recording mode by said control means, when said double-sided recording mode is specified.

[Claim 4] An ink jet recording device given in claim 1 characterized by performing automatically selection of record concentration by said concentration selection means when said double-sided recording mode is specified thru/or one term of 3.

[Claim 5] An ink jet recording device given in claim 1 characterized by carrying out record by record concentration of said one side recording mode as long as there is no assignment of said double-sided recording mode by said mode assignment means thru/or one term of 4.

[Claim 6] An ink jet recording device given in claim 1 characterized by having an electric thermal-conversion object which generates heat energy which makes ink produce film boiling as an energy generation element for carrying out the regurgitation of the ink in a recording head thru/or one term of 5.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates ink to the ink jet recording device which records discharge and a record image towards a recorded material in detail about an ink jet recording device according to recording information from a recording head.

[0002]

[Description of the Prior Art] Conventionally, in the recording device formed in a printer, a copying machine, etc., it is constituted so that a record image may be recorded on a recorded material (henceforth a record sheet) based on recording information, and it can divide into an ink jet type, a wire dot type, a thermal type, a laser beam type, etc. by the recording method. also in this, the recording device by the ink jet recording method is easy to be able to record by the ability breathing out ink towards a record sheet from a record means (recording head), and to be able to record a record image with easily high definition miniaturization of a record means at high speed, for there to be little noise, since a running cost is moreover cheap and it is a non impact method, and to record a color picture especially using multicolor ink -- etc. -- it has the advantage. In addition, in such a recording device, there is much direction in case record is generally made by only one side of a record sheet.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in recent years, what is recorded on both sides of a record sheet from the point that an ecological movement takes for prospering and values a paper resource as part of the cure has come to be desired. Then, by this method, although the case where record is made to both sides of a record sheet also in an ink jet recording device is increasing, since a record medium is liquid ink, there is a problem of being easy to carry out the reverse side projection of the image recorded depending on the quality of paper of a record sheet and the class of ink which are a recorded material in that reverse side. When a record sheet was thin, and the recorded image carried out reverse side projection, there was [ the time when especially the recorded image is deep, and ] a problem of the image recorded on the original field having become hard to see, or reducing record grace.

[0004] Paying attention to the conventional problem which was mentioned above, in double-sided record, the object of this invention is to offer the ink jet recording device which cannot be conspicuous and can carry out reverse side projection according to want so that it may aim at the solution.

[0005]

[Means for Solving the Problem] A concentration change means by which this invention changes record concentration in order to attain this object, It has a concentration selection means to choose said record concentration, and a mode assignment means to specify a double-sided recording mode or an one side recording mode. When it is the ink jet recording device in which record implementation in the mode specified by this mode assignment means is possible and said double-sided recording mode is specified by said mode assignment means It is characterized by providing a control means controlled to change said record concentration according to concentration chosen by said concentration selection means.

[0006]

[Function] According to this invention, if a double-sided recording mode is specified by the mode assignment means, by the control means, it will record by the concentration which can control reverse side projection according to the record concentration beforehand chosen by the concentration selection means, and implementation of record by light concentration will be attained with a concentration selection means by choosing concentration lower than the time of an one side recording mode at the time of a double-sided recording mode.

[0007] Moreover, by changing the amount of the ink by which the regurgitation is carried out per area as a means to change concentration, this can be embodied and it is controlled to become less the amount of the above-mentioned ink than the time of an one side recording mode at the time of a double-sided recording mode.

[0008]

[Example] Below, based on a drawing, the example of this invention is explained in detail and concretely.

[0009] Drawing 1 shows the example of a configuration of the ink jet recording device concerning this invention. 10 is the cassette which can loading contain a record sheet 11, and it is fed at a time with one record sheet 11 loaded into this cassette 10 from the maximum upside with the feed roller 12. The record sheet 11 with which it was fed with the feed roller 12 is conveyed with the conveyance roller 14 in a record location through between top guide 13A and bottom guide 13B. This conveyance roller 14 carries out specified quantity [ every ] pitch delivery of the record sheet 11 to a record location, and as a means to record an ink image on the record sheet 11 conveyed with the conveyance roller 14, where a recording head 15 is carried in carriage 16, it is kept free [ migration ] in the record location. Although this recording head 15 was not illustrated, it was prepared in a part of detailed ink delivery, liquid route, and liquid route, and it is equipped with an energy generation means to heat ink by the exoergic resistor and to make a liquid breathe out. In addition, carriage 16 is not guided along with the guide shaft 17 and a guide rail 18, and carries out both-way migration perpendicularly at a drawing according to the drive motor and delivery device which are not illustrated. 19 is the platen prepared in the above-mentioned recording head 15 and the record location which counters, and is supporting the record sheet 11 from the rear-face side by the platen 19.

[0010] The record sheet 11 which had the ink image recorded is led to a flapper 21 with the blowdown roller 20, and when the double-sided recording mode is chosen, a flapper 21 is changed to the continuous line location of a graphic display, and feeds it into the re-feeding section 23 in which the record sheet 11 was formed by the equipment lower part along the conveyance way 22 here. And it is sent into the reversal pocket 25 by normal rotation of the positive inversion roller 24 here, and then the sense is reversed by inversion actuation of the positive inversion roller 24, and the change actuation to a flapper's 26 dashed line location from a graphic display continuous line location, and after being returned to the conveyance roller 14 through the conveyance way 27 which makes the shape of S character after that, it is again led on a platen 19. And the flapper 21 changed to the field previously recorded by the recording head 15 to this record sheet 11 by which reversal resending was carried out by the location shown with the dashed line of a graphic display after record of an image was carried out to the reverse field shows around, and it is conveyed up along the conveyance way 28, and while it had been reversed, sequential loading is carried out on the blowdown tray 29.

[0011] In addition, in the case of an one side recording mode, although the above explained the record actuation about the case of a double-sided recording mode, after record finishes by the recording head 15, a record sheet 11 is guided at the flapper 21 changed to the location of a graphic display dashed line, and is promptly discharged on the blowdown tray 29 along the conveyance way 28, and sequential loading is carried out on the blowdown tray 29.

[0012] In addition, when performing the above-mentioned double-sided record, record by recording mode which is later mentioned in order to prevent a record image carrying out reverse side projection at the rear-face side of the record sheet 11 and which was chosen beforehand is performed.

[0013] Drawing 2 shows the configuration of the control circuit concerning this invention. A storage means RAM for a storage means ROM to by\_ which various programs in case a record control section

for 1 to control record actuation of this invention ink-jet recording device and 2 are controlled by the record control section 1 here etc. are stored, and 3 to carry out the temporary storage of data, information, etc. fed from host equipment 4 for record, and 5 are the input sections for directing change actuation in various modes etc. to a record control section 1. Moreover, it is a motor in connection with [ in connection with a carriage drive motor in 6 ] sheet feeding and conveyance, and blowdown in 7, and 6A and 7A are temperature detection means by which each driver and 15A detect the driver for recording head 15, and 8 detects the temperature of a recording head 15, and can be controlled by the record control section 1 to change the record signal fed into driver 15A for recording heads based on the detection information from the temperature detection means 8.

[0014] Subsequently, the procedure of the control action at the time of the one side record by this invention thru/or double-sided record is explained according to drawing 3.

[0015] If a power supply is switched on, as shown in step S1, it becomes an one side recording mode automatically, and unless it is switched to a double-sided recording mode through the input section 5, it will progress to step S3 through step S2, and usual image recording of HS (high speed) and HQ (high quality) set up beforehand will be carried out.

[0016] In addition, it is the step which judges whether step S2 needs the same HS as the time of an one side recording mode, and HQ record in implementation of double-sided record, and in step S2, in affirmative decision, it progresses to step S4, and it serves as a double-sided recording mode. However, also in the case of a double-sided recording mode, the same record as the time of the one side record usual at step S5 can be chosen. That is, in step S5, when it is judged whether the above-mentioned selection was required and there is a demand of the above-mentioned selection, it is step S3, and image recording by the same HS as the time of one side record and HQ is carried out.

[0017] Moreover, in step S5, when record by the conditions set up as a double-sided recording mode is affirmation, it progresses to step S6, the below-mentioned low concentration record set up so that reverse side projection might not be carried out beforehand is carried out, and the example for performing such low concentration record to below is explained.

[0018] As the 1st example for realizing low concentration record at the time of the double-sided record by this invention, drawing 4 shows the distribution condition of the record dot. That is, this example is seen by performing the same infanticide record (draft record) as what is used at the time of HS mode, performs upper low concentration record, and prevents reverse side projection. In the record pattern of a dot-matrix configuration as shown in (A) of drawing 4, supposing - section is the record dot section, in HS mode, it is recording on (B) of drawing 4 by setting the heat period for record to one half by thinning out alternately the portion shown in O section. Since the record concentration on appearance becomes low since the number of dots recorded is set to one half, and the ink absorbed amount to a record sheet also decreases, reverse side projection stops being conspicuous at this time. However, you may make it not necessarily use not HS mode but how to thin out the dedication which reverse side projection cannot carry out easily about such infanticide record.

[0019] As the 2nd example for realizing low concentration record at the time of the double-sided record by this invention, drawing 5 shows the example to which the pulse width of a record signal is changed. That is, as are shown in the (B) and this example shortens beforehand pulse width of the heater driver voltage applied to the exoergic resistor which is an energy generation means to make an ink drop breathe out from (A), it lessens discharge quantity of ink by controlling through head driver 15A, and it prevents reverse side projection. Supposing (A) of drawing 5 is usually the heater pulse width at the of record now, (B) of drawing 5 is the heat pulse width at the time of double-sided record, since it has pulse width of short time amount compared with the usual pulse width shown in (A), can lessen ink discharge quantity at the time of record, and can make record concentration low. The reverse side projection at the time of double-sided record also stops for this reason, being conspicuous. In addition, the pulse width at this time is beforehand set as the degree on which record grace is seldom dropped. However, as shown in (A) of drawing 5, and (B), also when not one heat pulse but two or more heat pulses perform regurgitation control, ink discharge quantity can be lessened by same pulse width control.

[0020] Drawing 6 shows the 3rd example in order to realize low concentration record at the time of the double-sided record by this invention. This example is an example of application over the recording device of the gestalt which detects the temperature of a recording head 15 with the temperature detection means (temperature detection sensor) 8 established near the exoergic resistance of a recording head 15, and controls the pulse width of a recording head driving signal according to the temperature.

[0021] That is, in this example, the difference is usually beforehand established between the head temperature of the criteria at the time of a recording mode and a double-sided recording mode, and as the direction of ink discharge quantity at the time of a double-sided recording mode decreases, reverse side projection is prevented.

[0022] In drawing 6, 30 is the ink regurgitation section of an arm head 15, and it is the warm-up heater (subheater) at which 31 is prepared on a substrate 31 in the silicon substrate, and 32 is prepared in the temperature detection sensor 8. This temperature detection sensor 8 detects the temperature of the ink regurgitation section 30, and in order to control ink discharge quantity, it is made to become the heat pulse width corresponding to that temperature, when the temperature of the ink regurgitation section 30 becomes high compared with the reference temperature defined beforehand, in order to obtain the optimal ink discharge quantity beforehand. Moreover, when the temperature of the ink regurgitation section 30 becomes low under the effect of environmental temperature etc., heat pulse width is enlarged, or the warm-up heater 32 is made to drive if needed, the temperature of the ink regurgitation section 30 is raised, and it is controlled to increase ink discharge quantity. More here than the time of record, at the time of double-sided record, by usually setting up the above-mentioned reference temperature beforehand low from the time of record, ink discharge quantity is controlled, it cannot be conspicuous and reverse side projection can usually be carried out. In addition, 33 shows an ink delivery.

[0023] Drawing 7 shows the 4th example for realizing low concentration record at the time of the double-sided record by this invention. This example is an example of application in case the piezoelectric device 35 is formed as an energy generation means to make an ink drop breathe out, lessens discharge quantity of ink by controlling the driver voltage impressed to a piezoelectric device 35, and prevents reverse side projection.

[0024] Although the variation rate of the pressure wall 36 currently formed with the elastic body by impressing driver voltage to a piezoelectric device 35 is carried out and the ink in the ink liquid room 37 is made to breathe out from the ink delivery 33 in this example, at the time of double-sided record, ink discharge quantity is lessened by making low voltage impressed to this piezoelectric device 35, record concentration is made low, it cannot be conspicuous and reverse side projection can be carried out.

[0025] In addition, two or more low concentration recording mode is set up so that low concentration may be obtained gradually, although restricted to one kind as the mode in which a low concentration recording mode usually differs from a recording mode in the example described so far, and the inside in these modes to a user may be made to choose free according to record conditions.

[0026] Moreover, it cannot be overemphasized that it is a thing applicable not only to an above-mentioned all directions type but various kinds of large ink jet recording methods as an ink jet recording device.

[0027] (in addition to this) In addition, especially this invention is equipped with means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used also in an ink jet recording method in order to make the ink regurgitation perform, and brings about the effect which was excellent in the recording head of the method which makes the change of state of ink occur with said heat energy, and the recording device. It is because the densification of record and highly minute-ization can be attained according to this method.

[0028] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 description and the 4740796 description, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording

information and exceeds nucleate boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles in the liquid (ink) corresponding to this driving signal can be formed by one to one as a result, it is effective. A liquid (ink) is made to breathe out through the opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If this driving signal is made into a pulse configuration, since growth contraction of air bubbles will be performed appropriately instantly, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable. As a driving signal of this pulse configuration, what is indicated by the U.S. Pat. No. 4463359 description and the 4345262 description is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 description of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0029] As a configuration of a recording head, the configuration using the U.S. Pat. No. 4558333 description and U.S. Pat. No. 4459600 description which indicate the configuration arranged to the field to which the heat operation section other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of a delivery which is indicated by each above-mentioned description, a liquid route, and an electric thermal-conversion object is crooked is also included in this invention. In addition, the effect of this invention is effective also as a configuration based on JP,59-138461,A which indicates the configuration whose puncturing which absorbs the pressure wave of JP,59-123670,A which indicates the configuration which makes a common slit the regurgitation section of an electric thermal-conversion object to two or more electric thermal-conversion objects, or heat energy is made to correspond to the regurgitation section. Namely, no matter the gestalt of a recording head may be what thing, it is because it can record now efficiently certainly according to this invention.

[0030] Furthermore, this invention is effectively applicable also to the recording head of the full line type which has the length corresponding to the maximum width of the record medium which can record a recording device. As such a recording head, any of the configuration which fills the length with the combination of two or more recording heads, and the configuration as one recording head formed in one are sufficient.

[0031] In addition, this invention is effective also when the thing of a serial type like the example of a top also uses the recording head fixed to the main part of equipment, the recording head exchangeable chip type to which the electric connection with the main part of equipment and supply of the ink from the main part of equipment are attained by the main part of equipment being equipped, or the recording head of the cartridge type with which the ink tank was formed in the recording head itself in one.

[0032] Moreover, as a configuration of the recording device of this invention, since the effect of this invention can be stabilized further, it is desirable to add the regurgitation recovery means of a recording head, a preliminary auxiliary means, etc. If these are mentioned concretely, a preheating means to heat using the capping means, the cleaning means, the application of pressure or the attraction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and a reserve regurgitation means to perform the regurgitation different from record can be mentioned.

[0033] Moreover, although only one piece was prepared also about the class thru/or the number of a recording head carried, for example corresponding to monochromatic ink, corresponding to two or more ink which differs in others and record color or concentration, more than one may be prepared the number of pieces. That is, although not only the recording mode of only mainstream colors, such as black, but a recording head may be constituted in one as a recording mode of a recording device or the paddle gap by two or more combination is sufficient, for example, this invention is very effective also in equipment equipped with at least one of each of the full color recording mode by the double color color of a different color, or color mixture.

[0034] Furthermore, in addition, in this invention example explained above, although ink is explained as a liquid It is ink solidified less than [ a room temperature or it ], and what is softened or liquefied at a room temperature may be used. Or by the ink jet method, since what carries out temperature control is



common as a temperature control is performed for ink itself within the limits of 30 degrees C or more 70 degrees C or less and it is in a stability regurgitation range about the viscosity of ink, ink may use what makes the shape of liquid at the time of activity record signal grant. In addition, in order to prevent the temperature up by heat energy positively because you make it use it as energy of the change of state from a solid condition to the liquid condition of ink, or in order to prevent evaporation of ink, the ink which solidifies in the state of neglect and is liquefied with heating may be used. Anyway, ink liquefies by grant according to the record signal of heat energy, and this invention can be applied also when using the ink of the property which will not be liquefied without grant of heat energy, such as that by which liquefied ink is breathed out, and a thing which it already begins to solidify when reaching a record medium. The ink in such a case is good for a porosity sheet crevice or a breakthrough which is indicated by JP,54-56847,A or JP,60-71260,A also as liquefied or a gestalt which counters to an electric thermal-conversion object in the condition of having been held as a solid. In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0035] Furthermore, in addition, as a gestalt of this invention ink jet recording device, although used as an image printing terminal of information management systems, such as a computer, the gestalt of the reproducing unit combined with others, a reader, etc. and the facsimile apparatus which has a transceiver function further may be taken.

[0036]

[Effect of the Invention] As explained above, when said double-sided recording mode is specified by the mode assignment means according to this invention Since the control means controlled to change said record concentration according to the concentration chosen by said concentration selection means was provided Without dropping record grace at the time of double-sided record, by controlling record concentration appropriately, it could not be conspicuous and reverse side projection could be carried out, it was user-friendly for the user and offer of the ink jet recording device which can prevent reverse side projection was attained.

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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross section showing typically the configuration of the ink jet recording device concerning this invention.

[Drawing 2] It is the block diagram showing the configuration of the circuit for control by this

[Drawing 3] It is the flow chart showing the procedure of the control action at the time of the recording-mode selection by this invention.

[Drawing 4] It is explanatory drawing usually showing the dot array at the time of the low concentration record by the 1st example of this invention (B) as compared with the dot array at the time of record (A).

[Drawing 5] It is explanatory drawing usually comparing and showing the pulse shape by the 2nd example of this invention on the both sides of (B) at the time of (A) and low concentration record at the time of record.

[Drawing 6] It is the perspective diagram showing the configuration of the circumference of the recording head concerning the 3rd example of this invention.

[Drawing 7] It is the cross section showing the configuration of the circumference of the recording head concerning the 4th example of this invention.

[Description of Notations]

1 Record Control Section

5 Input Section

8 Temperature Detection (Means) Sensor

11 Record Sheet (Recorded Material)

15 Recording Head

15A Head driver

21 26 Flapper

25 Reversal Pocket

22, 27, 28 Conveyance way

30 Ink Regurgitation Section

33 Ink Delivery

35 Piezoelectric Device

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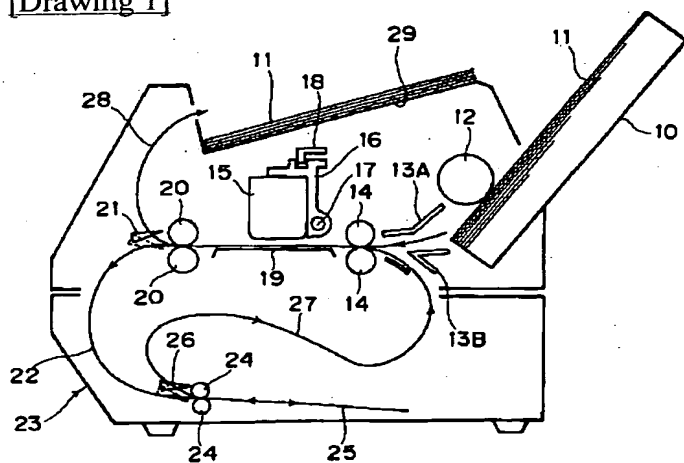
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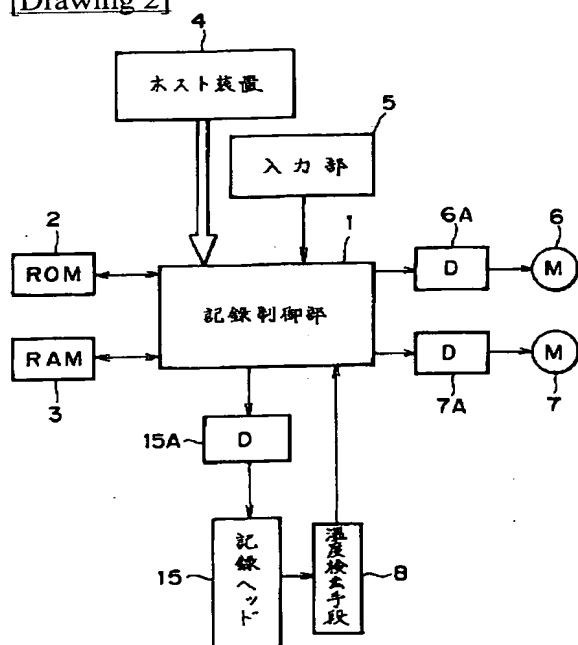
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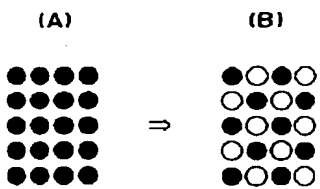
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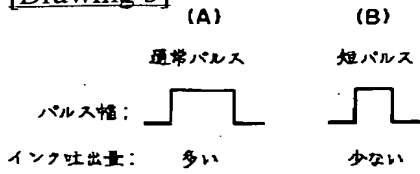
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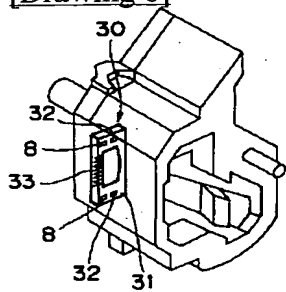
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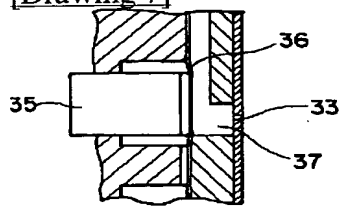
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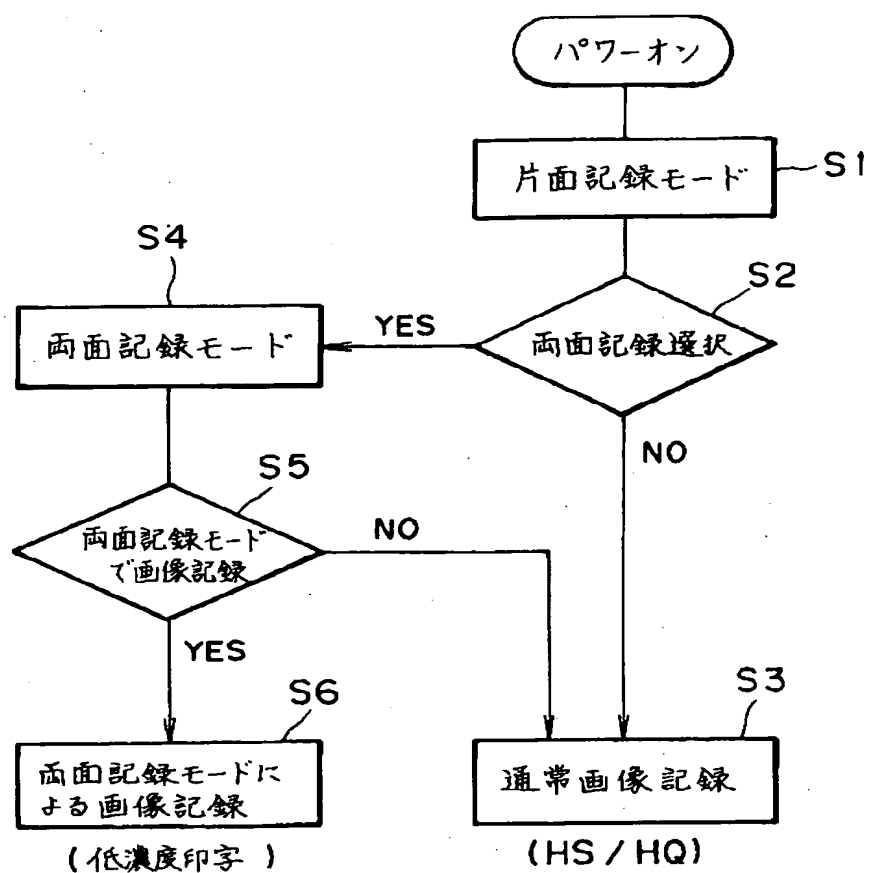
[Drawing 6]



[Drawing 7]



[Drawing 3]



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